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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/892,878	06/28/2001	Jun Dong Kim	08245.0027	3043

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EXAMINER

RAO, SHRINIVAS H

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 07/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/892,878

Applicant(s)

KIM ET AL.

Examiner

Steven H. Rao

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 11-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-4 and 11-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Priority

Receipt is acknowledged of paper submitted under 35 U.S.C. 132 claiming priority from U.S. Patent Application No. 09/892,878 filed on June 26, 2001 which itself claims priority under 119(a)-(d) from Korean Patent Application No. 2000-36495 filed on June 29, 2000 , which papers have been placed of record in the file.

Request for Continued Examination Application

The request filed on 05/05/2000 for a request for Continued Examination Application (RCE) under 37 CFR 1. 114 based on parent Application No. 09/892,878 is acceptable and a RCE has been established. An action on the RCE follows.

Preliminary Amendment Status

Acknowledgment is made of entry of preliminary amendment filed on 05 / 05/ 2003 has been entered on May 13, 2003.

Therefore claims 1 and 3 as amended by the preliminary amendment and claims 11-13 presently newly added are currently pending in the Application.

Claims 5 to 10 have been cancelled by the preliminary amendment .

Drawings

The drawings as originally filed were previously accepted.

Claim Rejections - 35 USC § 103

Claims 1-4, and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al. (U.S. Patent No. 6,080,529 herein after Ye) in view of Lau et al. (U.S. Patent No. 5,173,542, herein after Lau) for reasons previously set out and reproduced below for ready reference. For response to Applicants' arguments see "response to arguments section" below.

With respect to claim 1 and 11 Ye describes a method of forming gate electrodes of a semiconductor device including the steps of: forming a gate insulation layer over the semiconductor wafer (Ye col. 11 lines 36-38, silicon dioxide layer not shown in the drawings), forming a conductive layer over the gate insulation layer (Ye fig. 2a # 216, col. 11 line 41), forming a low-dielectric layer over the conductive layer (Ye fig. 2A # 218, col. 11 line 42), forming a photo resist pattern whose width is equal to the exposure limit on the low dielectric layer (Ye layer 224 or 324, col. 21 lines 55-65, col. 22 lines 1-2 , col. 6 lines 5-21, especially line 18), patterning the low dielectric layer using the photo resist pattern as a mask (Fig. 2c , col. 6 lines 9- 18, col. 12 lines 28-32), removing photo resist pattern (col.11 lines 33-34), shrinking the low dielectric pattern.

Ye does not specifically mention shrinking the low dielectric pattern.

However, Lau, a patent from the same filed of endeavor (both Ye and Lau deal low dielectric layers made from organic polymers Including PTFE, etc. see claim 3 of Ye and col. 1 lines 20-37 of Lau) describes the standard procedure of the shrinking the low-

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dielectric pattern by curing the low-dielectric pattern (Lau in col.14 line 37 and claim 11 © curing) to cross link the polymers.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Lau's curing (i.e. shrinking of dielectric) step in Ye's method steps to cross-link the polymer of the low dielectric layer . (Lau col. 1 lines 49-61).

Forming gate electrodes by patterning the conductive layer and the gate insulation layer using the shrunken low dielectric layer pattern as a mask (Figs. 3D and 2 B, col. 11 lines 66- col. 12 lines 32, col. 15 lines 6-10). (it is noted that Ye teaches at least two separate embodiments in figs. 2A—G and 3 A-G, however Ye in at least col. 15 lines 5-8 teaches the steps of embodiments in figs. 2 and 3 are interchangeably used).

It is noted that the order of performing the step of shrinking the low-dielectric pattern before/after removal of the photoresist pattern is different in claims 1 and 11.

However, it is well settled law that the order of performing method steps is prima facie obvious. " As a matter of fact selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results. In *Re Burhaus*, 154 F.2d. 690,69 USPQ 330 (CCPA 1946). See also *Ex parte Rubin*, 126 USPQ 440 (BAPI 1959) and *In re Gibson*, 39 F.2d 975, 5 USPQ 230 (CCPA 1930).

Therefore irrespective of the order of performing the step/s the recited claims are prima facie obvious the applied prior art.

With respect to claim 2 wherein the low-dielectric layer is formed of an organic spin-on glass or inorganic spin-on glass layer. (Ye col. 6 lines 22-26-organic low k dielectric materials and col. 14 line 65-66 glass-like siloxane) .

With respect to claim 3 wherein the forming of the low –dielectric layer comprises : depositing low dielectric layer over the conductive layer for the gate electrodes (fig.2 G # 230, col. 13 lines 55-60) and soft –baking the low-dielectric layer at a predetermined temperature .

Ye does not specifically describe soft-baking its low-dielectric layer at a predetermined temperature.

However, Lau, a patent from the same filed of endeavor describes in col. 14 line 35 the standard procedure of soft –baking the low dielectric is soft baked after its application to drive off any remaining solvents from the mixture applied.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to include Lau standard “ soft-baking step in Ye’s method to remove any excess liquid remaining after the application of the dielectric polymer mixture on the wafer. (Lau col.14 Line 36).

With respect to claims 4 and 13 , wherein the shrinking the low-dielectric pattern by curing the low-dielectric pattern at 400-500 degrees centigrade. (Lau in col.14 line 37 and claim 11 © curing at 300-450 degrees to cross link the polymers). Therefore it would have been obvious to curing between 400-500 degrees without more because it was previously done in the over lapping range of 300-450 degrees.

With respect to claim 6, to the extent understood, it recites the same steps as claim 1 except for reciting, " a material layer" instead of a "conductive layer " in claim 1 and rejected for the same reasons as stated above under claim 1 . (It is noted that the sequence of performing the process steps is slightly changed in claim 6, however as well settled case law (Exparte Rubin and In re Burhaus , any order of performing steps is prima facie obvious in absence of new or unexpected results).

With respect to claim 12 wherein forming the low dielectric layer includes, depositing a low-dielectric layer over the conductive layer. (rejected for the same reasons as stated under claims 1 and 11 above).

Response to Arguments

Applicant's arguments filed September 19, 2002 have been fully considered but they are not persuasive for the following reasons.

It is noted that Applicants' arguments are based on piece meal attacks on references, it has been held that one cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references. In re Keller, 208 USPQ 871 (CCPA 1981).

Applicants' first contention is that Ye and Lau do not teach or suggest the combination of steps " removing the photoresist pattern and shrinking the low dielectric pattern, wherein removing the photoresist pattern and shrinking the low-dielectric pattern are performed at the same time is not persuasive because " As a matter of fact selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results." In Re Burhaus, 154 F.2d. 690,69 USPQ 330 (CCPA

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1946). See also Ex parte Rubin, 126 USPQ 440 (BAPI 1959) and In re Gibson, 39 F.2d 975, 5 USPQ 230 (CCPA 1930).

Applicants' next contention that Lau does not teach a curing process in which shrinkage of a low dielectric pattern occurs is not persuasive because as stated in Applications specification page 5 lines 9- 12 when low dielectric layers having organic/inorganic layers when cured at 400-425 degrees centigrade shrink by about 10-18 % . (See table I also).

Lau teaches curing at 300-450 degrees centigrade of the same materials for the same purpose (cross linking) therefore what is true for the applicants' (naturally occurring phenomena i.e. shrinkage during curing process) is also true for the Lau reference.

Applicants' conclusion that, " In another example, Lau et al. teaches that the effect of curing time, curing temperature and amount of bistriazene D is controlled in order to reduce any " crazing" that results from swelling a film. (See Lau et al. Col. 16, line 49 through col. 17 line 3). Therefore, Lau et al. teaches a curing process that causes swelling, but the compensates for the swelling .. In other words Lau et al. relates to controlling swelling in a film that is caused by the Lau's attempts to control swelling which can be also be a result of release of gases (similar to that described in Applicants' specification) and the effects of curing in both the Applicants' specification and the Lau reference is the same namely crosslinking and shrinkage of the polymers used as insulators in multiplayer integrated circuits having the pattern formed thereon .

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It is noted that the outstanding rejection states that the step of " patterning the low dielectric layer using the photoresist pattern as a mask was described in figure 2c and col. 6 lines 9 to 18 and col. 12 lines 28-32 of Ye and removing the photoresist pattern is described in col. 6 lines 19-21 and col. 12 lines 35-37) and shrinking the low dielectric pattern is taught by Lau at least in col 14. line 37 and col. 11 , etc.).

Applicants' similar argument to that stated above with respect to new claims 11-13 is not persuasive for the same reasons as those stated above.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Steven H. Rao whose telephone number is (703) 3065945. The examiner can normally be reached on 8.00 to 5.00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703) 7463926 for regular communications and (703) 872-9319 for After Final communications.

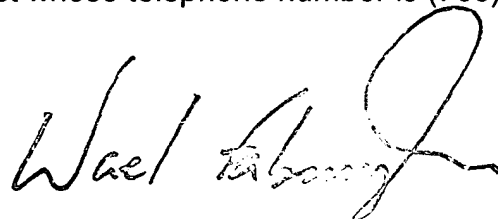
Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 3067722.



Steven H. Rao

Patent Examiner

July 21, 2003.



SUPERVISORY PRIMARY EXAMINER
TECHNOLOGY CENTER 2800